



Milling and turning with SINUMERIK:

CNC solutions for the shopfloor

SINUMERIK

Answers for industry.

SIEMENS



Simple to set up ...

Contents

Shopfloor solutions for CNC machines with SINUMERIK	03
Milling with the SINUMERIK 840D sl and ShopMill:	04
Flexible for every application	05
Application example: Milling contours with ShopMill	
Milling with the SINUMERIK 802D sl:	06
The standard for CNC milling machines	07
Application example: Contour calculator	
Turning with the SINUMERIK 840D sl and ShopTurn:	08
Turning made easy	09
Application example: Simulation	
Turning with the SINUMERIK 802D sl:	10
The standard for CNC turning machines	11
Application example: Thread-cutting	
Facts and figures for SINUMERIK 802D sl, ShopMill and ShopTurn overview	12



... simply SINUMERIK.

CNC solutions for the shopfloor using SINUMERIK

Do you want everything to run smoothly on your shopfloor? To be able to schedule and process your orders while meeting expected standards in quality? Do you also want to manufacture small lot sizes economically? Then SINUMERIK® is your right choice.

Specialized expertise for the shopfloor

Behind SINUMERIK, there are machine tool control systems, drives and motors as well as complete solutions for machine tool automation. Used in many industry segments, this is the expertise that we have implemented especially for the shopfloor and for your applications.

Two control systems for turning and milling

With the SINUMERIK 802D sl and the SINUMERIK 840D sl we are offering you two numerical controls from the CNC controller family SINUMERIK, combining the flexibility and benefits of conventional machining with the productivity and efficiency of a CNC machine. Designed for typical shopfloor jobs and machines, these solutions will decisively improve operations with just about every CNC turning and milling machine.

Simple to program and operate

The graphic operator and programmer interfaces used for ShopMill® and ShopTurn® ensure that everything runs perfectly on the SINUMERIK 840D sl. They are application-oriented to match the skill of a trained operator and are easy to use, even for beginners. Programming effort is low and can be done without the G-code knowledge usually required in the industry. Programming is dialogue-oriented and graphically assisted. This means changeovers can also be carried out quickly.

Milling with SINUMERIK 840D sl and ShopMill: Flexible for every application



If you are looking for a solution with comprehensive functions for milling, our SINUMERIK 840D sl numerical control, combined with the ShopMill operator interface, will fit the bill. Due to its outstanding performance and flexibility, this CNC is also an asset in making molds and dies. The ShopMill operating and programming interface is designed for straightforward machine operation and easy workpiece programming. You will benefit from consistent CNC solutions with the same look and feel – whether you are turning or milling.

Less time from the drawing to the finished workpiece

Whether you are doing the setup, programming or machining itself, ShopMill will assist you in operating your machine using visual, user-friendly representation of the job tasks and by graphical help displays.

It all starts with the setup

Setup is no problem if you have the right software tools. The functions provided in manual mode enable you to set up your machine quickly and practically. This includes, for example, determining the workpiece position in the machine, as well as measurement of the tools used. For workpiece and tool measurement, ShopMill provides you with both manual and automatic measuring functions.

Typical examples of measurement functions include: "Align edge," "Align plane," "Determine hole center" or "Align workpiece to two or three holes."

It goes without saying that ShopMill also provides the full range of moldmaking functions of the SINUMERIK 840D sl.

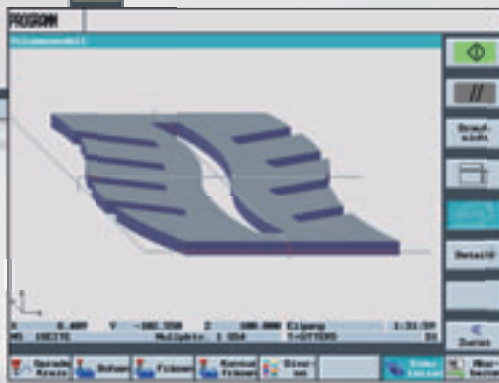
Everything is thought of during programming

When it comes to programming, ShopMill has no limits:

- Programming with the DIN/ISO editor and standard or ShopMill cycles directly on the machine.
- Modification of externally created DIN/ISO programs.
- The work plan editor for graphical programming inputs on the machine. No DIN/ISO programming knowledge required.
- Training and work preparation on the PC with SinuTrain®, without tying up the machine.



Quickly and safely from the drawing to the finished workpiece – with ShopMill



Application example:

The following example will show how easily you can produce even complex workpieces in a minimum amount of time. We have chosen a designer CD stand to illustrate the operation. The ShopMill program for the CD stand was created right off the drawing, directly on the machine. A decisive advantage: Programs can be edited with ShopMill as much as you like and so be optimized on the machine. The workpiece geometry is created using the contour calculator in ShopMill and machined with the path milling cycle.

Milling contours in ShopMill:

- Simple entering of workpiece geometry. "Drawing dot-to-dot" also possible for complex contours.
- Conversion of contours and position patterns in DXF format with the CAD reader and further processing in the contour calculator.
- Linking of contours in the path milling cycle – roughing, finishing and chamfering in one cycle.

New ShopMill features:

- New cycle for trochoidal milling for machining workpieces with grooves open on the side. Tool paths are gentle and round, drastically reducing vibrations during machining as well as reducing overall machining times.
- New plunge milling cycle for stock removal in grooves and cavities in weak workpieces. There is hardly any bending of the tool which distinctly reduces the danger of vibrations and permits greater cutting depths.

The complete instructions for machining the designer CD stand, including programs, can be found under www.siemens.com/cnc4you.

ADVANTAGES AT A GLANCE

Flexible programming

- Graphical programming without the need for DIN/ISO knowledge, using practical ShopMill cycles.
- Save time by linking work steps.
- Convenient input of milling contours and position patterns.
- Highly flexible DIN/ISO programming with graphical contour and cycle support.

User-friendly operation

- Tool and workpiece measurement with graphical support.
- USB stick input directly on the front of the operator panel.
- 3-D simulation with zoom and machining time calculation.
- Identical user interface for milling and turning: ShopMill and ShopTurn.

Intelligent functions to increase productivity

- Multiface machining assisted by swivel cycles.
- Process measurement for workpieces and tools.
- Supporting PC software for training and work preparation (e.g. CAD reader), without tying up the machine.

Milling with SINUMERIK 802D sl: The standard for CNC milling machines



The SINUMERIK 802D sl is extremely user-friendly, with straightforward functions. This compact and powerful controller is an operator panel control for standardized milling machines with up to four axes and one spindle.

Hands-on support right from the start

The SINUMERIK 802D sl provides extensive programming support such as machining cycles, contour calculation and setup functions. During operation, you are supported by visual, user-friendly representation of the job tasks as well as graphical help displays.

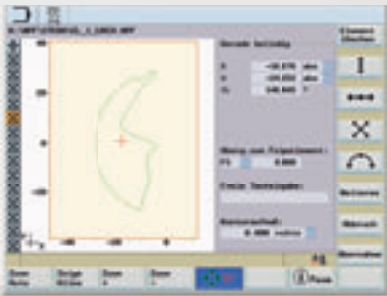
Setup

The SINUMERIK 802D sl will help you set up the workpiece and tools. Whether you want to determine the workpiece position in the machine or measure the tools used, the functions available in JOG mode (manual) allow you to set up the machine quickly and practically. Lengths and diameters are determined by scratching the workpiece or by automatic measurement using a sensing element.

Programming made easy

When it comes to programming, there are no limits:

- DIN/ISO programming is done directly on the machine
- Change externally created DIN/ISO programs
- Use programs with Siemens standard cycles for milling and drilling



Application example:

Contour calculator

Fast programming of contours directly on the machine:

- Simple input of workpiece geometry – “Drawing dot-to-dot.”
- Contours can also be determined when there are many unknown intermediate values.
- The input values in the dialogue can be changed at any time after entering, by using the “Recompile” key, e.g. to change radii and chamfers.



Three-axis machining for moldmaking

The SINUMERIK 802D sl offers excellent conditions for moldmaking applications, such as:

- Jerk limitation separate for rapid feed/ feed.
- Following error compensation (pre-control).
- 100 Look Ahead blocks.
- Online compressor.
- Large moldmaking programs can be transferred or executed directly by CompactFlash Card, USB stick or via Ethernet.

ADVANTAGES AT A GLANCE

User-friendly operation

- Identical operator interface for milling and turning.
- Tool and workpiece measurement with graphical support.
- Convenient handling of part programs via CompactFlash Card, USB stick and Ethernet.
- Graphical program simulation with zoom.

Time-saving programming

- Flexible G-code programming.
- Graphical support for technological machining cycles and contour calculator.
- Fully integrated user manual.

Increasing productivity

- Four-axis machining and moldmaking are included as standard.
- Maintenance-free operation and convenient remote diagnosis.
- Supporting PC software for training and work preparation.

Turning with SINUMERIK 840D sl and ShopTurn: Turning made easy



The combination of SINUMERIK 840D sl and ShopTurn enables the operator to handle even the most challenging turning jobs with ease. Together with the ShopTurn operation and programming software for turning machines, machine operation and workpiece programming become child's play.

Designed with the operator in mind

In all phases – setup, programming and machining – ShopTurn optimally reflects the way the operator looks at the work process. Visual, user-oriented presentation of the job tasks assists you in the operation of the machine, via graphical help displays. The machining plan shows every step such as roughing, finishing, tapping or grooving.

Setup is easy

Workpiece and tool setup is no problem with ShopTurn thanks to its functions in manual mode. These include determining the workpiece origin in the machine as well as measuring the tools used. ShopTurn will provide you with manual as well as automatic measurement functions, such as "Manual measurement," "Automatic measurement" or "Measurement with magnifying glass."

A choice of programming

ShopTurn offers you different programming possibilities:

- Direct input of machining parameters without having to create a program (manual machine).
- Programming with the DIN/ISO editor and standard or ShopTurn cycles directly on the machine.
- Changing externally created DIN/ISO programs.
- A work plan editor for graphical program inputs to the machine. DIN/ISO programming knowledge is not required.
- Machine preparation on the PC with SinuTrain, without tying up the machine.

A new ShopTurn feature:

- A new "swivable B axis" function to support highly complex turning machines with swivel axis and associated milling spindle – to reduce programming times and increase productivity.



Application example:

Simulation

In order to avoid collisions and to check the workpiece program, ShopTurn provides efficient simulation before machining.

The simulation works with actual tool data and the work offset of the machine.

The simulation can be controlled by start, stop and reset softkeys as well as an override. In order to have an overview for critical machining jobs, it is possible to have the program run in the single-block mode. The actual data for axis position, machining block, tool and feedrate are displayed at the same time.

The machining time required is automatically calculated and displayed in the simulation, so offering more planning reliability in the calculation phase.

ShopTurn simulation permits presentation of the following programs:

- DIN/ISO programs, also with machining cycles.
- Machining step programs.

By the way: ShopTurn can simulate in every situation – whether on the front face, the peripheral surface or swiveled planes with B axis.

The following representations are possible:

- Three-window view with plan view, side-view and volume model.
- 3-D volume model of the finished part with cross sections and detailed view.

ADVANTAGES AT A GLANCE

Flexible programming

- MANUAL mode for manual machining without creating a program.
- Graphical program input without DIN/ISO knowledge with practically oriented ShopTurn cycles.
- Graphical input with linking of machining steps.
- Convenient input of turning and milling contours.
- Highly flexible DIN/ISO programming with graphical contour definition and cycle support.

User-friendly operation

- Tool and workpiece measurement with graphical support.
- USB stick input directly on the front of the operator panel.
- 3-D simulation with zoom and machining time calculation.
- Identical user interface for milling and turning: ShopMill and ShopTurn.

Intelligent functions to increase productivity

- Input of counter-spindle functions by dialogue.
- Process measurement for workpieces and tools.
- Supporting PC software for training and machine preparation (e.g. CAD reader), without tying up the machine.

Turning with SINUMERIK 802D sl: The standard for CNC turning machines



The SINUMERIK 802D sl is extremely user-friendly, with straightforward functions. This compact and powerful controller provides operator panel control for standardized turning machines, also with driven tools.

Easy does it

For machine setup, you can simply use the functions in JOG mode. These include determination of any tool corrections and the workpiece origin.

For tool and workpiece measurement in setup mode, the SINUMERIK 802D sl allows manual measurement. For tooling, there are also automatic measurement functions, namely "Manual tool measurement in X and Z directions" or "Automatic measurement with a probe."

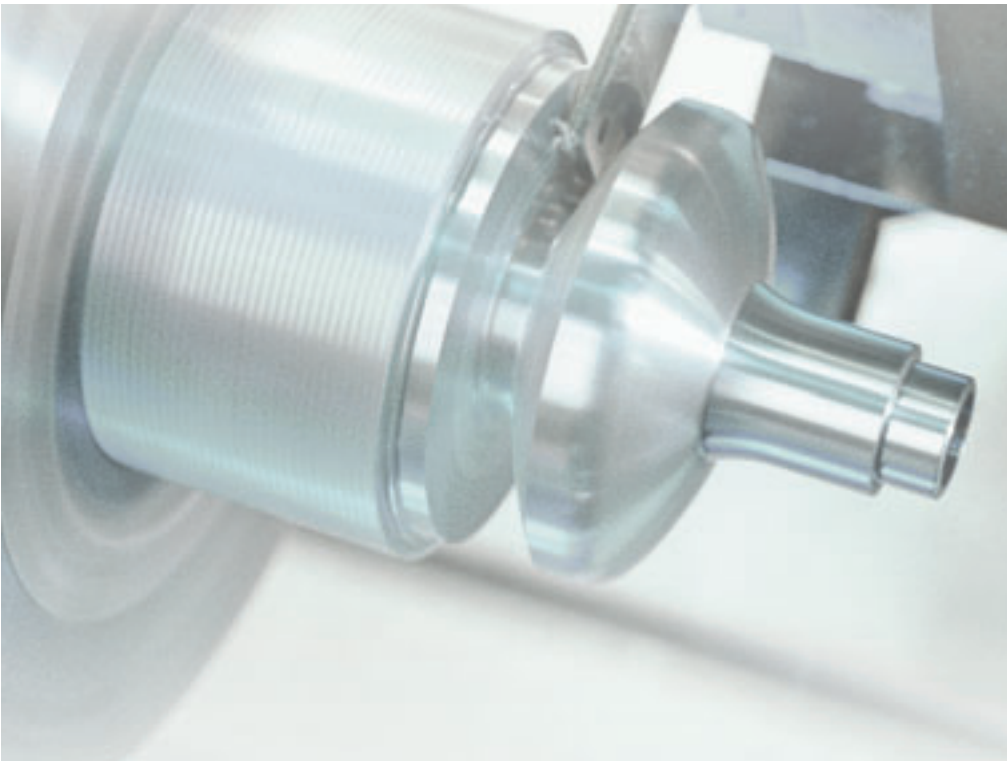
Programming made easy

There are no limits when it comes to programming:

- With DIN/ISO programming directly on the machine.
- Changing externally created DIN/ISO programs.
- Machining cycles for turning, drilling and milling.

More possibilities with Manual Machine plus

The additional user interface, Manual Machine plus, provides you with new options for turning. A second type of programming is activated by a simple switch. This makes it possible to create a program by hand with simple cycles. This program can then be used like a normal program for other workpieces. Manual Machine plus is particularly suitable for training. Depending on the level of expertise, the same machine can be used either as a manual machine or as a CNC machine.



Application example:

Thread-cutting

The thread-cutting cycle allows you to achieve higher workpiece quality.

- It is possible to specify the number of roughing cuts and non-cuts.
- By pressing the help button for a parameter, the context-sensitive help is directly displayed in the integrated user manual.
- It is possible to choose between constant and degressive infeed in order to control the cutting forces.

This is how easy it is:
Enter thread pitch as a value.
Alternatively, choose a metric thread size between M3 and M60 directly from the integrated list.

ADVANTAGES AT A GLANCE

User-friendly operation

- Identical user interface for turning and milling.
- Graphical support for the setup of tool and workpiece zeros.
- CompactFlash Card, Ethernet and USB stick for unlimited part program memory.
- Graphical program simulation with zoom.

Time-saving programming

- Flexible G-code programming.
- Graphical support for technological machining cycles and contour calculator.
- Fully integrated user manual.

Increasing productivity

- C axis machining with driven tools.
- Maintenance-free operation and convenient remote diagnosis.
- Supporting PC software for training and machine preparation.

Easy tool and workpiece setup similar to ShopMill / ShopTurn

- Manually by scratching
- With probe or sensing element
- Graphical support

Graphical contour programming

- Contour calculator like in ShopMill / ShopTurn
- Calculation of partially defined geometric elements
- Contours can be changed at any time in the dialog

Graphical support for cycles

Turning:

- Facing, stock removal, grooving, under-cutting, thread-cutting, thread chains

Drilling:

- Centering, boring with / without compensating chuck, drilling out, deep-hole drilling, tapping, reaming, linear or circular position pattern

Milling:

- Face milling, contour milling, rectangular pockets and spigots, circular pockets and spigots, slots on a circle, grooves on a circle, circular grooves, thread milling

Graphical simulation

- For program control as broken-line graphics

Manual Machine plus

- Programming without DIN/ISO knowledge
- Graphical support of turning cycles such as stock removal, boring, grooving, tapping, repairing threads
- Linking of contours with stock removal cycles

Universally applicable

- Remote diagnosis with RCS 802
- Processes part programs to DIN standards
- Changeover commands to other ISO G-codes and return to DIN standard
- Ethernet onboard for networking
- Simple remote service with RCS 802

Commercially-available CompactFlash Card and USB as storage medium

- Fast processing, storage and loading of programs
- Extension of the part program memory
- Complete series commissioning

Graphical programming



- Transparent, clearly structured programming in machining steps
- Programming without DIN/ISO know-how
- Easily understandable symbols for characterizing the machining steps
- Linking of contours with solid machining cycles
- Linking of drilling and milling operations with position patterns
- Simple modification, insertion and deletion of machining steps

Contour programming

- Powerful contour calculator for creating contours in the milling plane and on the peripheral surface of cylindrical workpieces
- Automatic calculation of partially defined geometric elements
- True-to-scale representation of contours with up to 255 contour elements
- Importing DXF files via an optional CAD reader is possible

Machining cycles

Milling cycles for free contours

- Machining of contour pockets with up to 12 isolated contours
- Machining of contour spigots with up to 12 isolated contours
- Automatic detection and follow-up machining of residual material
- Automatic or manual specification of machining starting point with possibility for pre-drilling
- Insertion strategy: linear, diagonal, helical

Milling cycles for standard contours

- Face milling cycle with lateral limitation
- Rectangular and circular pockets with different insertion strategies
- Rectangular and circular spigots
- Longitudinal and circular grooves
- Thread milling
- Combined countersinking/thread milling
- Engraving of any texts
- Open groove for trochoidal milling and plunge milling

Drilling cycles

- Centering, reaming, boring
- Boring with chip break and stock removal function
- Tapping with chip break and stock removal function

High-speed settings

- Moldmaking cycle for the selection of the machining type and contour tolerance

Position pattern

- Any position pattern in the milling plane and on the peripheral surface of cylindrical workpieces
- Position patterns such as line, circle or grid
- Hiding individual positions in position patterns

Complete machining

Peripheral surface machining

- Any drilling and milling operations on the peripheral surface
- Milling of parallel-walled guide grooves on cylindrical workpieces

Multiple clamping

- Runtime-optimized machining of identical parts in multiple clamping units

Swivel cycle

- Any drilling and milling machining in swiveled machining planes on five-axis milling machines
- Flexible input of swivel angle in the workpiece coordinate system (axis, solid or projection angle)

DIN/ISO programming

- Text editor for large moldmaking programs
- Input support for standard machining cycles
- Input support for automatic measuring cycles (optional)

Simulation

- Effective simulation of machining steps and DIN/ISO programs
- Presentation in plan view, three-side elevation and 3-D view
- Quick view of moldmaking programs (PCU50)

Tools

- Clear representation of tool and setup data in a table
- Workpiece count and tool-life monitoring with sister tools

Setup functions

- Menu-prompted contact function to determine work offset, also in swiveled machining planes
- Tool measurement by using the scratching method or touch probe
- Face milling cycle for workpiece preparation
- Swivel cycle for setup and measurement tasks

Automatic functions

- Block search also for defined machining operations in position patterns
- Traversing path display of machining steps in G-code (basic block display)

Accessories

- PC training and programming software
- CAD reader for the PC

Numeric controllers

ShopMill is available on the following numerical controls

- SINUMERIK 810D / 840D / 840Di
- SINUMERIK 840D sl / 840Di sl

ShopTurn – Data and Facts

Graphical programming



- Transparent, clearly structured programming in machining steps
- Programming without DIN/ISO know-how
- Easily understandable symbols for characterizing the machining steps
- Linking of contours with stock removal cycles
- Linking of drilling and milling operations with position patterns
- Simple modification, insertion and deletion of machining steps

Contour programming

- Powerful contour calculator for creating turning and milling contours
- Automatic calculation of partially defined geometric elements
- Automatic calculation of grinding allowance, also with negative values
- Importing DXF files via an optional CAD reader is possible

Machining cycles

Stock removal cycle

- Stock removal for freely definable contours
- Axis- and contour-parallel roughing and finishing
- Automatic detection of residual material
- Stock removal cycle for plunge cutting and plunge turning of freely definable contours
- Freely definable blank contour

Recessing/undercut cycles

- Recessing cycle for any trapezoidal recesses
- Undercut cycle for any threads and DIN threads
- Undercut shape E, shape F

Thread-cutting cycle

- Face thread, longitudinal and tapered threads
- Constant and variable pitch
- Linear and degressive infeed
- Multiple-thread machining

Drilling cycles

- Centering and deep-hole drilling, boring and tapping with stationary tools
- Any drilled holes on face and peripheral surfaces with driven tools

Milling cycles

- Any milling operations on face and peripheral surfaces
- Standard geometry such as circular and rectangular pockets
- Removal cycle for free geometries with residual material detection
- Engraving any texts

Position patterns

- Any position patterns on face and peripheral surfaces
- Position patterns such as line, circle or grid

Counter-spindle machining

- Counter-spindle cycle with graphical input
- Automatic workpiece transfer

Swivable B axis

- Milling and drilling on swiveled planes
- Turning with swiveled tools

DIN/ISO programming

- Fully functioning text editor for flexible creation of DIN/ISO programs
- Input support for standard machining cycles
- Input support for automatic measuring cycles (optional)

Simulation

- Effective simulation of work steps and DIN/ISO programs
- Presentation in turning plane, face-on and 3-D view

Tools

- Clear representation of tool and setup data in a table
- Workpiece count and tool-life monitoring with sister tools

Setup functions

- Menu-prompted scratching function to determine work offset
- Tool measurement by scratching or with probe
- Universal turning cycle for applications such as hollowing out soft end pieces

Manual machine

(with SINUMERIK 840D sl only)

- Additional operating capabilities for cycle-controlled turning machines
- Turning of straight lines and inclines with intermediate switch
- Individual machining of turning, milling and drilling cycles without program creation
- Thread repair cycle

Automatic functions

- Block search also for defined machining operations in position patterns
- Display of traversing paths of machining steps in G-code (basic block display)

Accessories

- PC training and programming software
- CAD reader for the PC

Numeric controllers

ShopTurn is available on the following numerical controls

- SINUMERIK 810D / 840D / 840Di
- SINUMERIK 840D sl / 840Di sl

Get more information

Comprehensive online support, information about applications, products, FAQs, forums and more are available on the online portal:
www.siemens.com/sinumerik

More on shopfloor manufacturing:
www.siemens.com/cnc4you

Information on training:
www.siemens.com/sinumerik/training

Siemens AG
Industry Sector
Motion Control Systems
P.O. Box 31 80
91050 ERLANGEN
GERMANY

www.siemens.com/sinumerik

Subject to change without prior notice
Order No.: E20001-A850-P610-X-7600
Dispo 06311
21/15428 MK.MC.10.STAN.52.8.08 WS 09083.
Printed in Germany
© Siemens AG 2008

The information provided in this brochure contains merely general descriptions or characteristics of performance which in actual case of use do not always apply as described or which may change as a result of further development of the products. An obligation to provide the respective characteristics shall only exist if expressly agreed in the terms of contract.

All product designations may be trademarks or product names of Siemens AG or supplier companies whose use by third parties for their own purposes could violate the rights of the owners.